



Assignment # 1

Solution of MTH301

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Question.

Evaluate the limit along the paths

(a) the y -axis ($x = 0$),

(b) the x -axis ($y = 0$),

(c) the line $y = mx$ for all value of $m \neq 0$.

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - y^3}{x^2 + y^2}$$
$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - y^3}{x^2 + y^2}$$

Solution:-

(a):- The y -axis ($x=0$) for

Put $x = 0$

$$= \lim_{y \rightarrow 0} \frac{-y^3}{y^2} = \lim_{y \rightarrow 0} -y = 0$$
$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - y^3}{x^2 + y^2}$$

(b):- The x -axis ($y=0$) for

Put $y = 0$

$$\lim_{x \rightarrow 0} \frac{x^2}{x^2} = 1$$

(c):- The line $y = mx$ for all the value of $m \neq 0$

Let $(x,y) \rightarrow (0,0)$ along $y = mx$

So that $y \rightarrow 0$ as $x \rightarrow 0$

$$= \lim_{x \rightarrow 0} \frac{x^2 - m^3 x^3}{x^2 + m^2 x^2} = \lim_{x \rightarrow 0} \frac{x^2(1 - m^3 x)}{x^2(1 + m^2)} = \frac{1}{1 + m^2}$$

This is a constant and will have different value for different m.

Thus $(x, y) \rightarrow (0, 0)$ $f(x, y)$ does not exist.

END